McGinnis Chen Associates Inc
ARCHITECTS I ENGINEERS

June 27, 2012 Via E-Mail (Lisa.Lambeth@dgs.ca.gov)

Ms. Lisa Lambeth, RPA
Regional Manager
DGS / RESD / BPM
1304 O Street, # 300
Sacramento, CA. 95814

Re: 450 N Street Vision Glass 18th Floor Cracks – #12080.00 RP
Subj: Letter Report

Ms. Lambeth,

This letter contains the investigation comments and findings for the reported vision glass crack May 01, 2012 at the Board of Equalization (BOE) Building (Project) located at 450 N Street in Sacramento, California.

Introduction:
McGinnis Chen Associates, Inc. (MCA) was contacted by Lisa Lambeth on the morning of May 01, 2012 to perform a visual observation and evaluation of reported cracks seen in the 18th floor, north elevation vision glass (Glass #2 in Figure 1) after a loud noise was heard by office workers.

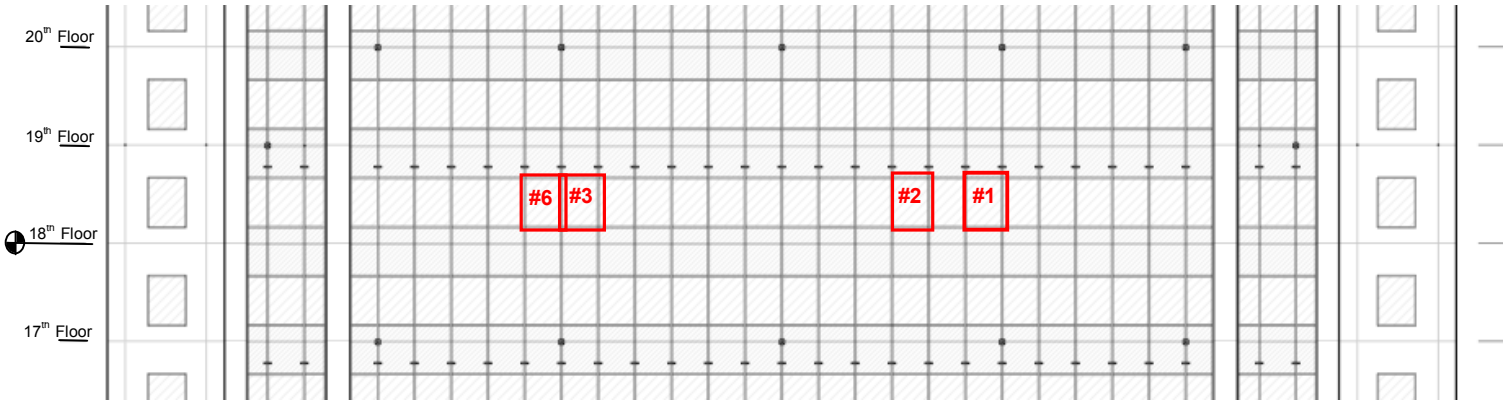

Figure 1 – Partial North Elevation, Vision Glass (#1, #2 & #3) observed with surface cracks on May 01, 2012. Vision Glass #6 was observed to have a surface flaw during the glass removal on May 18, 2012.

Two workers who occupy the cubicles near the vision glass in Figure 1 marked #1 and #2 reported hearing straining noises and a cracking/popping sound before noticing cracks in the #2 glass. The workers were relocated and the cubicles adjacent to the observed cracked vision glass were taped off to prohibit entry.

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Prior to MCA's arrival, cracks were observed and reported at two other north elevation locations (Figure 1 – identified as #2 and #3) and two locations on the west elevation (Figure 2 – identified as #4 and #5).

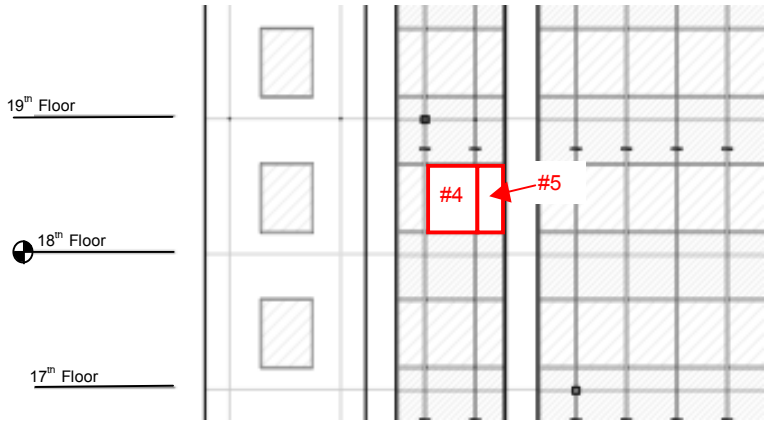


Figure 2 – Partial West Elevation – Vision glass (#4 & #5) observed with surface cracks on May 1, 2012

General/Reference:

The vision glass is an assembled "Insulated Glass Unit" (IGU) comprised of an exterior and interior 1/4-inch thick piece of heat strengthened glass with a 1/2-inch aluminum spacer between (Figure 3). Each glass surface in an IGU is given a number for identification and reference. The following report will reference these glass surfaces.

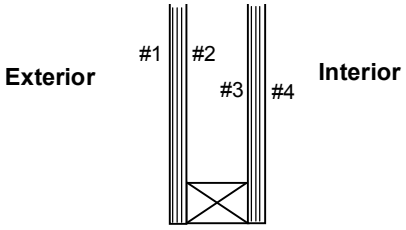


Figure 3 – IGU with Glass Surfaces Identified

MCA performed a limited visual review of the glass in place (including sounding), during removal (May 18, 2012) and after removal (May 22, 2012), and checked the existing installation perimeter (glazing pocket) for conditions that may have contributed to surface flaws. MCA performed sounding (hand impact) of the glass at windows #1 and #2 during the May 1 site visit and the windows were determined to be secure and the cracks did not propagate from the sounding impact. None of the cracks were observed to grow in length over the time of the investigation. No IGU failures, or "fogging", were observed at any of the windows. MCA's observations are presented in the table below with sketches and photos included the attached appendix:

Glass No.	Elev.	Description/location of Surface Flaw	Gasket Condition	Glazing Pocket	Glass Surface the Flaw is Felt	Edge Flaws at Origin
#1	S	**See Appendix A – Vision Glass #1**; Single crack originating from a rough edge condition.	Good	No Obstruction	#4	Yes
#2	S	**See Appendix A – Vision Glass #2**; Three cracks (smooth) originating from a rough edge condition.	Good	No Obstruction	#4	Yes
#3	S	**See Appendix A – Vision Glass #3;** Single crack originating from the right mullion.	Good	No Obstruction	#4	Yes
#4	W	**See Appendix A – Vision Glass #4;** Single **scratch** (rough surface) at sill near left corner.	Good	No Obstruction	**#3**	**No**
#5	W	**See Appendix A – Vision Glass #5;** Arcing crack at bottom left corner.	Good	No Obstruction	#4	Yes
#6	S	**See Appendix A – Vision Glass #6;** Single **scratch** (rough surface) in the middle of glass. No edge origination. Uneven texture of the flaw, and multi-directional.	Good	No Obstruction	#4	**No**

Table 1 – Window Investigation Observations

Evaluation:

Four of the six windows have hairline cracks propagating form edge flaws (Windows #1, #2, #3 and #4) including one crack at the interior surface of the interior pane (Window #4). The edge flaws appear to be the source but the specific cause to initiate the crack and propagate cannot be determined. Original construction, minor cyclic movements of the building to more significant

building movement and thermal differences (center to edge) over the life of the building may have induced the cracking. The actual period of time that the cracks originated is also not known. It is possible that all of the cracks have been in place for many years. The noises reported by the office workers may have been related to the window cracks for Window #2 as no other structural conditions (connections, joints etc..,) in the proximity lend to producing sounds of that nature; however, no geological (seismic) or weather conditions (large temperature change, high winds, etc..) for triggering such a noise and resulting cracks are known to have occurred in the recent days.

The scratches are most likely from the time of original construction. MCA attempted to reproduce the scratches using several common tools but was unsuccessful, as the force of one individual could not attain the pressure needed to make a scratch.

Recommendation:

All surface flaws observed in high-rise curtain wall glass should be investigated. When any crack occurs on the exterior pane, the course of action should be immediate with protection of the public below until the replacement is complete. When the surface flaws are found on the interior pane as observed during this investigation, immediate protection of the public below is not critical and the replacement work can be a more planned event. Relocation of workers in the proximity of the glass should be performed when glass flaws are encountered and the glass taped with strapping tape if the crack is observed to grow in length over time until the window replacement is completed.

Please call me if you have any questions regarding the above information.

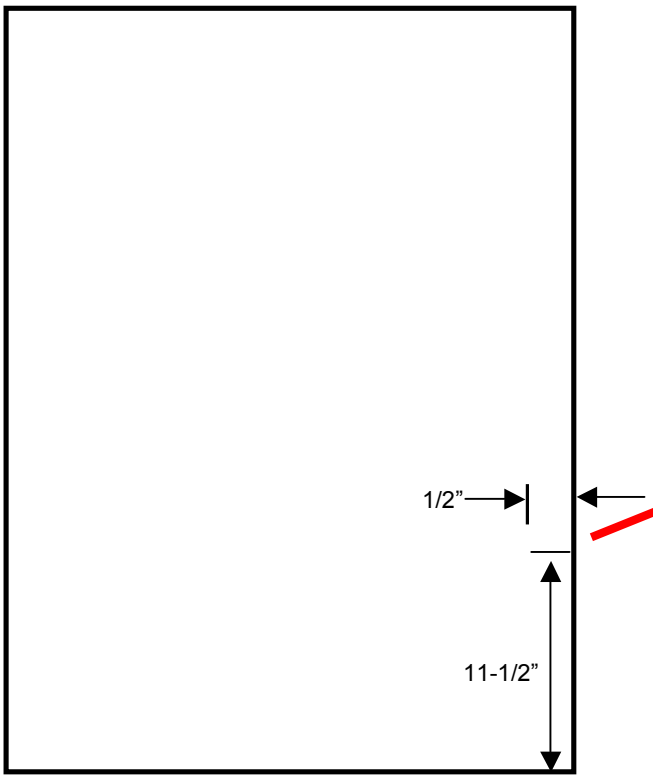
Sincerely,

Jeff Martin
McGinnis Chen Associates, Inc.

Attachment: Appendix A

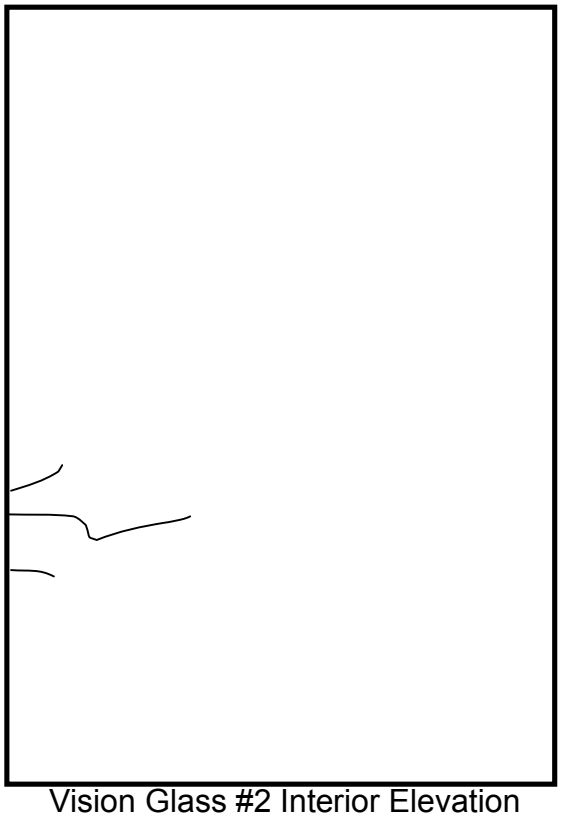
JM:

APPENDIX A



Vision Glass #2 Interior Elevation

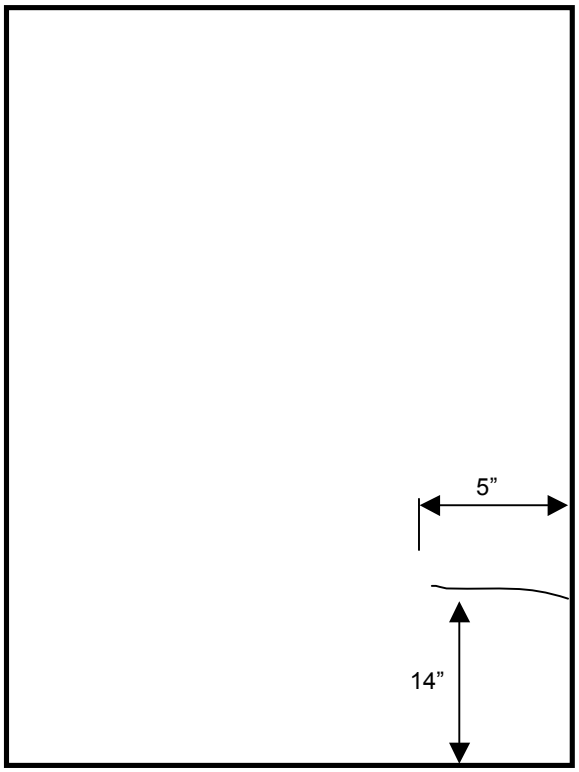
Photograph of crack and edge flaw.



Vision Glass #2 Interior Elevation

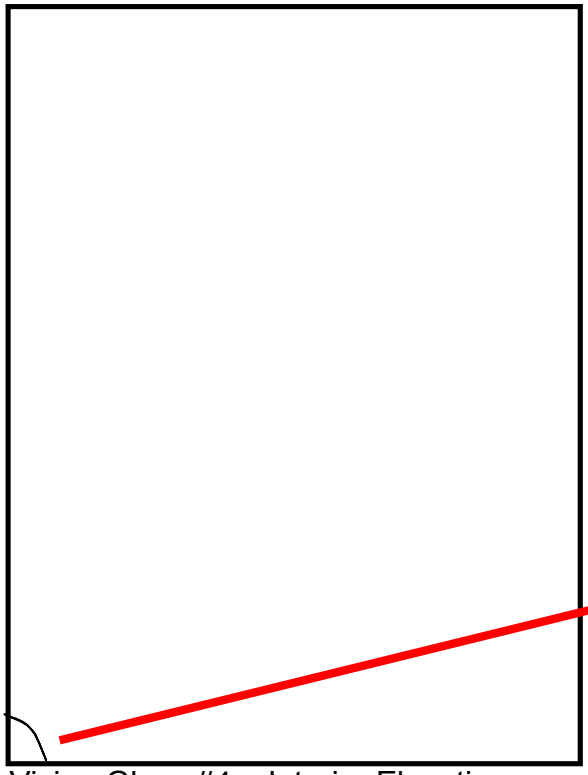
Edge view of edge flaws and cracks.

View of cracks in Vision Glass #2



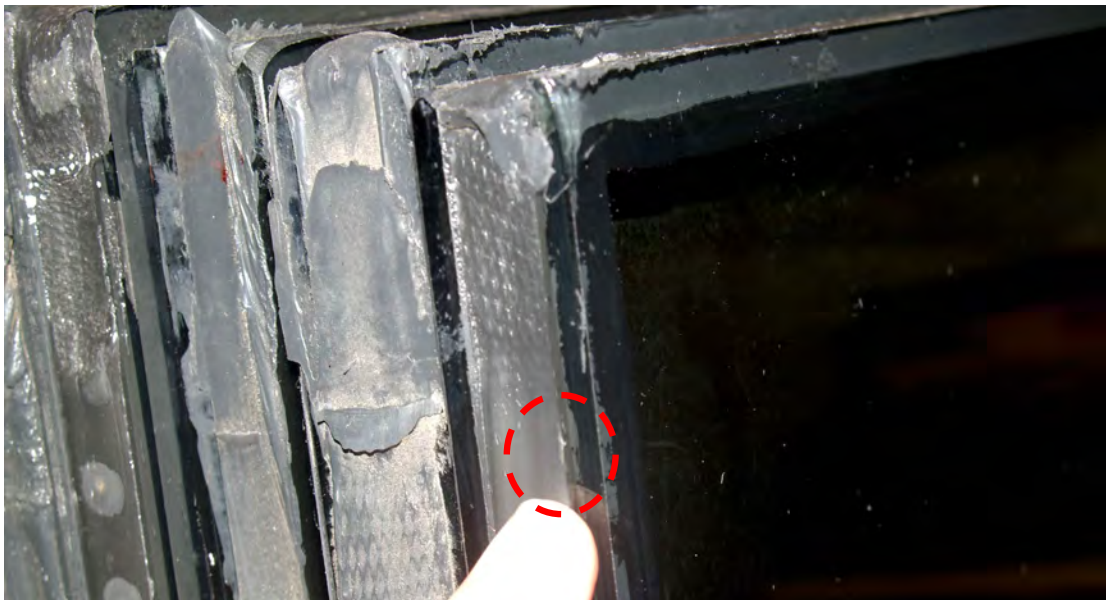
Vision Glass #3 Interior Elevation

Note – No good photographic documentation of Vision Glass #3 was obtained.

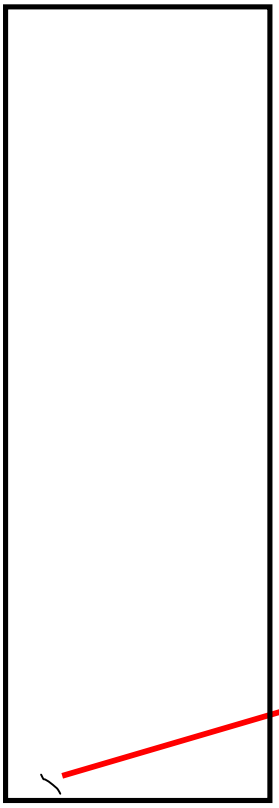


Vision Glass #4 – Interior Elevation

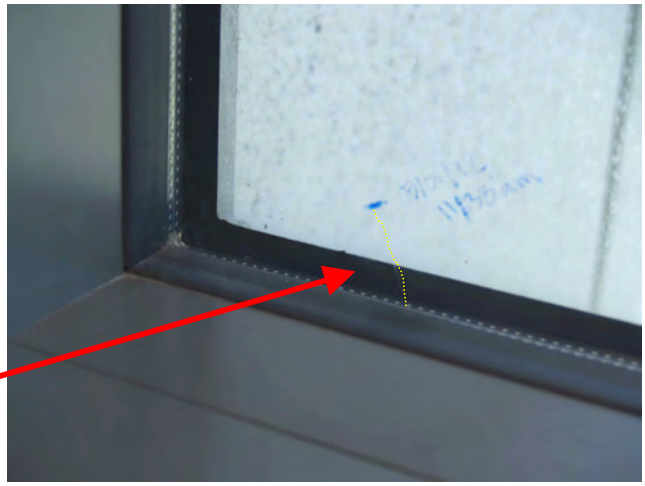
Photograph of crack in Vision Glass #4



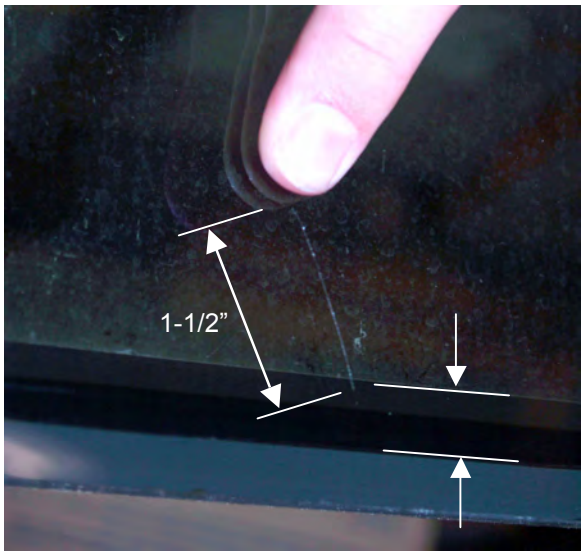
Photograph of break at edge of glass on plane #3 (inside face of interior sheet of glass). Some edge flaw condition is encountered.



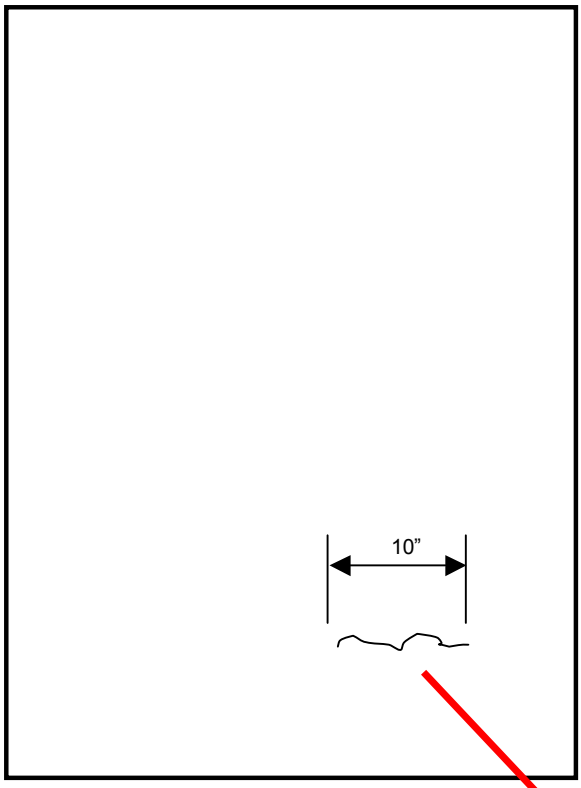
Vision Glass #5
Interior Elevation



Photograph of scratch in Vision Glass #5



Photograph of scratch, note the distance to the edge of glass the scratch is.



Vision Glass #6 – Interior Elevation

Photograph of surface flaw on Vision Glass #6